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UTILITY PATENT APPLICATION TRANSMITTAL <small>(Only for new nonprovisional applications under 37 CFR § 1.53(b))</small>	Attorney Docket No. 7000-041	
	First Inventor or Application Identifier	Reeves, Douglas
	Title	AUTHORIZING COMMUNICATION SERVICES
	Express Mail Label No.	EL555716417US

APPLICATION ELEMENTS <small>See MPEP chapter 600 concerning utility patent application contents.</small>	ADDRESS TO: Commissioner for Patents Box Patent Application Washington, DC 20231
<p>1. <input checked="" type="checkbox"/> *Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)</p> <p>2. <input checked="" type="checkbox"/> Specification [Total Pages 34] (preferred arrangement set forth below) — Descriptive title to the invention — Cross References to Related Applications — Statement Regarding Fed sponsored R & D — Reference to Microfiche Appendix — Background of the Invention — Brief Summary of the Invention — Brief Description of the Drawings (if filed) — Detailed Description — Claim(s) — Abstract of the Disclosure</p> <p>3. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 3 sets of 7]</p> <p>4. <input checked="" type="checkbox"/> Oath or Declaration [Total Pages 3] a. <input checked="" type="checkbox"/> Newly executed (original or copy) b. <input type="checkbox"/> Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 17 completed) [Note Box 5 below] i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).</p> <p>5. <input type="checkbox"/> Incorporation By Reference (useable if Box 4b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.</p>	<p>6. <input type="checkbox"/> Microfiche Computer Program (Appendix)</p> <p>7. <input type="checkbox"/> Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) a. <input type="checkbox"/> Computer Readable Copy b. <input type="checkbox"/> Paper Copy (identical to computer copy) c. <input type="checkbox"/> Statement verifying identity of above copies</p> <p>ACCOMPANYING APPLICATION PARTS</p> <p>8. <input checked="" type="checkbox"/> Assignment Papers (cover sheet & document(s))</p> <p>9. <input checked="" type="checkbox"/> 37 C.F.R. § 3.73(b) Statement <input checked="" type="checkbox"/> Power of Attorney (when there is an assignee)</p> <p>10. <input type="checkbox"/> English Translation Document (if applicable)</p> <p>11. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations</p> <p>12. <input type="checkbox"/> Preliminary Amendment</p> <p>13. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized)</p> <p>14. <input type="checkbox"/> *Small Entity <input type="checkbox"/> Statement filed in prior application, Statement(s) Status still proper and desired</p> <p>15. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed)</p> <p>16. <input type="checkbox"/> Other: _____</p> <p>*NOTE FOR ITEMS 1 & 14: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).</p>

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<input type="checkbox"/> Continuation	<input type="checkbox"/> Divisional	<input type="checkbox"/> Continuation-in-part (CIP)	of prior application No: _____ / _____
Prior application information:			Examiner: _____ Group/Art Unit: _____

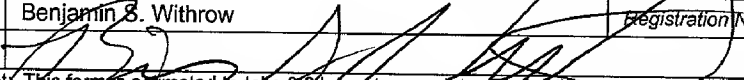
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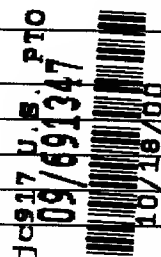
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See 37 C.F.R. §§ 1.27 and 1.28.

Complete if Known

Application Number
Filing Date October 18, 2000
First Named Inventor Reeves, Douglas
Examiner Name
Group/Art Unit
Attorney Docket No. 7000-041

TOTAL AMOUNT OF PAYMENT (\$1518.00)



METHOD OF PAYMENT (check one)

FEE CALCULATION (continued)

1. ☒ The Commission is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number 18-1164

Deposit Account Name Rhodes & Mason, P.L.L.C.

- ☒ Charge Any Additional Fee Required Under 37 CFR §§1.16 and 1.17

2. ☒ Payment Enclosed:
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FEE CALCULATION

1. BASIC FILING FEE

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	710.00
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	
SUBTOTAL (1)					(\$710.00)

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
36	-20** = 16	X 18.00 =	288.00
9	-3** = 6	X 80.00 =	480.00

Multiple Dependent Claims

** or number previously paid, if greater; For Reissues, see below

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim
109	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent
SUBTOTAL (2)				(\$768.00)

3. ADDITIONAL FEES

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examination action	
115	110	215	55	Extension for reply within first month	
116	390	216	195	Extension for reply within second month	
117	890	217	445	Extension for reply within third month	
118	1,390	218	695	Extension for reply within fourth month	
128	1,890	228	945	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt.	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40.00
146	710	246	355	Filing a submission after final rejection (37 CFR §1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR §1.129(b))	

Other fee (specify)

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$40.00)

SUBMITTED BY

Name (Print/Type) Benjamin S. Withrow

Registration No. 40,876
(Attorney/Agent)

Complete (if applicable)

Telephone (919) 654-4566

Signature

Date October 18, 2000

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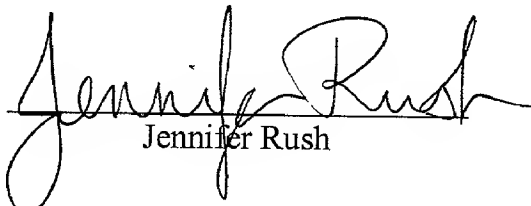
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Date of Deposit October 18, 2000

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AUTHORIZING COMMUNICATION SERVICES (our file 7000-041), and the attached fee
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Jennifer Rush

EL555716417US

UNITED STATES PATENT APPLICATION FOR GRANT OF LETTERS PATENT

**Douglas S. Reeves
Samuel H. Christie, IV
INVENTORS**

AUTHORIZING COMMUNICATION SERVICES

Rhodes & Mason, P.L.L.C.

P.O. Box 1167
Cary, NC 27512
(919) 654-4566

AUTHORIZING COMMUNICATION SERVICESField of the Invention

The present invention relates generally to
5 authorizing communication services, and particularly, to
using special authentication to arrange for such services
over a network.

Background of the Invention

10 In the conventional public switched telephone
network (PSTN), there is a close association between
elements that carry voice traffic and elements that
manage telephony services, such as call setup and
teardown. This close association is not just a result of
15 technical advantages, but also a result of
telecommunications policy, which for many years allowed
telephone services to be run as a regulated monopoly.
One desirable outcome of this close association is that
call management elements can easily monitor and directly
20 control the state of the switches and links that carry
voice traffic.

In the future, telephony services will be provided
in a more open and dynamic fashion. In the emerging
network model, control of voice services and transport of
25 voice data are independent functions that may be provided
by two or more independent service providers. The
independence of voice service and data transport raises
the question of how to allow a service provider, which
offers call services, to directly control the network of
30 the business that offers the data transport. The owner
of the network that transports voice will likely be
unwilling to give direct control to the call service
provider, and may even be unwilling to reveal to the call
service provider the details of the network topology,

capacity, and current status, among many other factors bearing on the availability and quality of communication services.

5 The above situation is further complicated for end-to-end voice transmission as well as real-time transfer of audio and video, because multiple networks may be traversed to deliver the data. Each of these networks may be independently operated. Further, multiple service providers, such as long distance providers and cable
10 companies, may be involved as well. As such, there is a need for an effective way for a service provider to authorize the use of resources in data transport networks without knowing who will process the authorization.

A couple of solutions have been proposed;
15 unfortunately, each proposal is less than desirable. The first proposal was provided by the Packet Cable Consortium and related telephone services over cable networks. The Packet Cable Consortium proposed a model in which a telephony call server directly communicates
20 its authorization of resource reservation to each of the devices that implement that reservation. The assumption behind these standards is that there is only one provider, which provides both the voice transport and the call services. As discussed above, such a technique will
25 likely be ineffective in the emerging network model containing independent service and network providers.

In a document recently presented to the Internet Task Force (ITF) standards body, the Packet Cable Consortium proposed a different model acknowledging the
30 possibility of multiple network and service providers. However, if the model still operated under the assumption that the call service elements know how to directly communicate with and control the elements in the transport networks that are responsible for resource

reservation. Again, this limiting assumption does not fit the open environment of the emerging communication network model. Thus, there remains a need for an effective way to authorize the use of resources without
5 requiring the network provider to directly communicate with the service provider to reserve resources throughout the network to initiate authorization.

Summary of the Invention

10 The present invention provides for a communication server of a service provider to authorize resource reservation for a communication session over a packet-switched network without requiring the communication server to know the identity of or significant details
15 about the network elements providing the communication. The communication server is configured to provide secure authorization indicia to the terminal receiving or delivering information for the communication. The terminal presents the authorization indicia to one or
20 more network elements involved in reserving resources for the communication. The network element or elements will use the authorization indicia to authorize resource reservation for the communication, and may forward the authentication to additional network elements involved in
25 reserving resources for the communication.

Preferably, the authorization indicia are sent to the origination and destination terminals for the communication. Each terminal may use the authorization indicia to initiate reservation of resources from network
30 elements at opposite ends of a communication path facilitating the communication. The network elements will use the authorization indicia to complete provisioning of resources with any intermediate network elements.

Any of the network elements may use the authorization indicia to access a policy server to gain approval for reservation of the resources. The communication may provide transfer of data for any type of media, including voice, audio and video, where it is necessary to reserve sufficient bandwidth, quality of service, or like resource. The communication may be uni-directional or bi-directional to allow for all types of communications, from bi-directional voice and data applications to uni-directional downloading or streaming.

Those skilled in the art will appreciate the scope of the present invention and realize additional aspects thereof after reading the following detailed description of the preferred embodiments of the invention in association with the accompanying drawing figures.

Brief Description of the Drawing Figures

Figure 1 is a representation of a network depicting numerous elements in networks capable of incorporating and using the concepts of the present invention.

Figure 2 is a simplified block representation of various network elements and their relationships with one another according to the present invention.

Figure 3 is a simplified flow diagram for establishing a communication path between two terminals according to the present invention.

Figures 4A, 4B and 4C represent a preferred procedure for establishing a communication session using the session initiation protocol, RSVP messaging and COPS messaging according to the preferred embodiment of the present invention.

Figure 5 is a block representation of an edge router according to the present invention.

Figure 6 is a block representation of a call server according to the present invention.

Figure 7 is a block representation of a policy server according to the present invention.

5 Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like numerals indicate the same elements throughout the several views.

10

Detailed Description of the Preferred Embodiments

The present invention allows a communication service provider to authorize communications over a network without directly communicating with each and every
15 element in the network. Preferably, the communication server will provide authentication information or indicia to a terminal initiating or receiving communications. The terminal or terminals will send the authorization indicia to the network elements, wherein the
20 authorization indicia are sufficient to enable the various network elements requiring authorization to authorize the communication.

The invention is particularly applicable to audio, video, voice and like telephony communications over
25 packet-switched networks, such as the Internet and its supporting networks. Although the preferred embodiment of the invention is described below identifying specific protocols and software technologies, those skilled in the art will recognize numerous protocols and related
30 technologies that exist, and that will be developed, that are capable of carrying out the inventive concept described herein. Given the varying scope and application of the present invention, a brief overview of an IP network structure is provided in light of several

exemplary communication systems. The brief overview is followed by a detailed description of the operation of a preferred embodiment of the present invention.

Figure 1 is illustrative of the numerous
5 communication systems and networks that will benefit from the present invention. Those skilled in the art should recognize that those networks and technologies illustrated are merely exemplary and not intended to be limiting. At the heart of the network is the packet-
10 switched Internet Protocol (IP) network 10, or like network that is capable of interacting with numerous devices and additional networks. A communication server 12, such as a telephony call server or other communication control system used by a service provider
15 to control communications over the various networks, is used to control communications.

A series of edge routers, such as a traditional packet edge router 14, cable edge router 16, PSTN edge router 18, and wireless edge router 20, facilitate
20 communications between the IP network 10 and other communication networks. The traditional packet edge router 14 may interact with another network, such as a local area network (LAN) 22, to facilitate communications with any number of internet telephony devices 24 and
25 computers 26. The cable edge router 16 will operatively connect the IP network 10 to a cable access network 28, which connects cable users via cable modems 30 or media terminal adaptors 34. Preferably, computers 32 may connect directly to a cable modem 30, whereas telephony
30 devices 36 or traditional televisions or cable boxes 38 may interact with the media terminal adaptor 34.

The PSTN edge router 18 is preferably configured to connect the packet-switched IP network 10 to the traditionally circuit-switched network of the PSTN 40 via

a gateway 18A. The PSTN 40 will provide communications with telephony devices 42 in traditional fashion. The wireless edge router 20 will preferably provide communications between the IP network 10 and the wireless communications network 44 to facilitate communications over the respective networks. Typically, the wireless network 44 will interact with base stations 46 to facilitate wireless communications with mobile terminals, such as wireless personal digital assistants and mobile telephones 48.

Those skilled in the art will recognize that the term "edge router" is used in conjunction with the edge routers 14, 16, 18 and 20, and represents the various types of policy enforcement points sufficient to manage communications between various technologies and networks over the IP network 10. These edge routers may take on many different configurations, such as media gateways. Further, additional routers may be necessary throughout the IP network 10 to facilitate end-to-end routing between commercial domains.

In operation, uni-directional or bi-directional communications are established between one or more of the various telephony devices, computers and the like and are effected over the IP network 10 as authorized by one or more of the communication servers 12. The communication servers 12 are effectively in charge of providing the communication service, wherein access providers or operators of the IP network 10 and related elements, such as the edge routers 14, 16, 18, and 20, provide the infrastructure for the communication service. The elements of the IP network 10 may need to contact one or more policy servers 50 or other policy decision points to facilitate communications over the network and between two or more edge routers 14-20. In essence, the policy

servers 50 determine whether the requested communication is acceptable. In addition to the various communication networks, network infrastructures and service providers, the present invention also cooperates with an

5 authentication service 52 that is capable of authenticating a communication authorization. The authentication may use various types of certificates and encryption, such as those used in the secure sockets layer (SSL) protocol currently used in connection with
10 electronic banking and commerce.

The application is best understood in association with Figure 2, wherein many of the elements shown in Figure 1 are generically depicted and associated with new reference numbers to facilitate a clear and concise
15 description of the invention. Figure 2 assumes that communications are being established between an originating terminal 54 and a destination terminal 56. The originating and destination terminals 54 and 56 may be any of the telephony devices, computers or like
20 devices depicted and described in association with Figure 1. The originating terminal 54 will be configured to communicate with an originating edge router 58 over a network to gain access to the IP network 10. Likewise, the destination terminal 56 will communicate with the
25 destination edge route 60 over a network to gain access to the IP network 10. Similarly, the originating and destination edge routers 58 and 60 are analogous to any of the edge routers 14-20 described in Figure 1.

An originating call server 62 is associated with the
30 originating terminal 54, and a destination communication server 64 is associated with the destination terminal 56. The communication servers 62 and 64 will preferably communicate over a packet-switched network with the respective originating and destination terminals 54, 56.

The originating and destination edge routers 58, 60 will communicate over packet-switched networks with originating and destination policy servers 66, 68, respectively.

- 5 Prior to facilitating communications, a user of the originating and destination terminals 54 and 56 will subscribe to network access from some network service provider. The network service provider provides the basic access to the IP network 10 through the
- 10 corresponding originating or destination edge router 58, 60. The user will also subscribe to communication services, such as telephony services, from a communication service provider. The basic flow of call setup and reservation is provided in Figure 3. Assuming
- 15 that a telephony communication is desired, when the originating user attempts to make a telephone call, the originating communication server 62 of the communication service provider is contacted by the originating terminal 54 (block 100).
- 20 The originating communication server 62 will verify that the calling user is a valid subscriber, and determine that the originating user subscribes to the requested service. The originating communication server 62 will then authorize the requested service, if
- 25 appropriate, by issuing authorization indicia information or like information. This authorization indicia will preferably contain the identity of the originating user, the identity of the communication service provider, and the resources the originating user is authorized to
- 30 receive. The indicia may also contain the communication server address and a correlation tag. The correlation tag is useful to correlate the access provider with the service provider. Such a correlation is very useful to facilitate billing between the access network and service

provider as well as the user of the service. The authorization indicia is preferably time-stamped and digitally signed according to the authentication protocol provided by the authentication server 52. The time-stamped and signed authorization information will be referred to as a "media authorization object" (MAO).

Importantly, the authorization procedure may allow the authentication server 52 to send authentication indicia to establish the MAO at the originating communication server 62 or originating terminal 54. The network elements can then process the MAO in addition to the request for resources to determine if the request is authorized. The various terminals, communication servers and network elements may incorporate any number of public and private key encryption technologies or authentication protocols to facilitate authorization without requiring the communication servers 62, 64 to have undue access to or unnecessary information about the network elements.

The originating communication server 62 preferably sends the MAO to the originating terminal 54 (block 102) as well as to the destination communication server 64 (block 104). The destination communication server 64 will forward the authorization to the destination terminal 56 (block 106). The originating terminal 54 and the destination terminal 56 will then attempt to establish a communication connection between them and reserve sufficient resources for the communication. In this case, a telephony connection, such as a voice connection, is established. To effect the communication connection, the originating and destination terminals 54 and 56 will embed the MAO provided by the originating communication server 62 to the necessary network elements responsible for reserving resources for the communication connection. These requests, along with the MAO, will be

propagated through the network to facilitate the communication connection.

As depicted in Figure 2, these network elements are represented by the originating and destination edge routers 58 and 60. As such, the originating terminal 54 will send the MAO embedded in the communication request to the originating edge router 58 (block 108). The originating edge router 58 will extract the MAO from the request and request permission to establish the connection and resources from the associated, originating policy server 66 (block 110). The originating policy server 66, assuming the connection is authorized, will grant permission based on the MAO and other traditional criteria for the originating edge router 58 to establish the connection (block 112). The policy servers 66, 68 may contact the respective communication server to confirm or aid the authorization process. The originating edge router 58 will inform the originating terminal 54 that the connection request was granted (block 114). The originating terminal 54 will alert the originating communication server 62 of the grant (block 116).

Concurrently at the opposite end of the network, the destination terminal 56 will send the connection request with the MAO embedded therein to the destination edge router 60 (block 118). The destination edge router 60 will request permission to establish the connection using the extracted MAO from the associated, destination policy server 68 (block 120). The destination policy server 68 will grant permission based on the MAO to the destination edge router 60 (block 122). The destination edge router 60 will alert the destination terminal 56 that the connection request was granted (block 124), wherein the

destination terminal 56 will alert the destination communication server 64 of the grant (block 126).

At this point, the originating terminal 54 has been authorized a connection to the originating edge router 58 and the destination terminal 56 has been authorized a connection to the destination edge router 60, based on the MAO. All that is left to finalize the communication is to effect a connection with sufficient resources between the originating edge router 58 and the destination edge router 60. To accomplish connection between the originating and destination edge routers 58, 60, provisioning over the network is effected using the MAO for authorization (block 128). This provisioning is effected by propagating the MAO with the connection request throughout the network and to any network elements that require authorization, prior to providing service.

As such, any network elements that are responsible for reserving resources will receive a request and the MAO. The network elements will be able to interpret the MAO, verify that it was recently issued by the communications service provider for a specific communication service, and determine that the authorization information has not been tampered with by unauthorized parties. The elements will simply forward a request with the MAO to the "next-hop" in the communication path until provisioning is complete. Once the provisioning is finalized, a communication or media path is established between the terminals 54, 56 (block 130).

Establishing a communication path as described above eliminates the need for the communication service providers to understand the configuration and directly communicate with access providers to authorize

communication services. Providing authorization using the MAO or like indicia, an authenticated authorization may be propagated through the network to establish a communication path in an efficient manner without

5 requiring the communication service providers to have unnecessary information about the access provider, and vice versa.

The above describes the overall concept of using an authenticated object to establish communications along a set path without requiring the communication server 12 to interact with and directly authorize the individual routing and switching devices facilitating the communication path. To fully disclose the best mode and provide an enabling disclosure, the following is a

10 detailed outline of a call flow using session initiation protocol (SIP) to initiate the communications; resource reservation protocol (RSVP) for reservation of resources for the communication; and the common open policy service (COPS) protocol for providing policy-based admission

15 control over requests for network resources. Although these protocols are used in the preferred embodiment, those skilled in the art will recognize various alternative protocols capable of implementing the concepts of the present invention.

25 As alluded to above, when initiating a communication requiring a reservation of resources to ensure proper quality of service and sufficient bandwidth, it is often necessary to establish a connection between the parties and then reserve the necessary resources. Again, a

30 telephony application is used as an example to facilitate an understanding of the invention. Figures 4A, 4B, and 4C depict a call flow diagram of a basic end-point-to-end-point call flow.

Assuming that the originating and destination terminals 54, 56 are telephony devices, the originating terminal 54 will collect dialed digits and send an initial SIP INVITE message to the originating communication server 62 when a user goes off hook and dials a telephone number (block 200). The initial INVITE message contains a SIP header to indicate the IP address of the destination terminal 56 to be used for subsequent end-to-end SIP signaling exchanges. The originating call server 62 acts as a SIP proxy. The originating communication server 62, acting as the SIP proxy, checks a subscriber database to authenticate the user's identification and ability to receive, and be billed for, the requested service.

15 If successful, the communication server 62, continuing to act as the SIP proxy, forwards the invitation to the intended destination terminal 56 (block 202) via the destination call server 64. As part of the forwarded invitation, the SIP proxy appends the MAO for authorizing the service and the resources necessary to provide the service. As part of the MAO, the SIP proxy preferably includes its own identity, and authenticates the information contained therein. The messaging in italics and bold in Figures 4A, 4B and 4C represents those messages including the MAO.

En route to the destination terminal 56, the invitation is sent to the destination communication server 64, also acting as a SIP proxy, which receives the invitation and forwards it to the destination terminal 56 along with the MAO (block 204). Preferably, the INVITE message is a "no ring (NORING)" invitation, which directs the destination terminal 56 to initiate the connection without immediately alerting the user of the destination terminal 56. The destination user is not alerted at this

point because the resource reservations required for the communication have not been made.

The destination terminal 56 will presumably respond favorably with a SIP session response message "183" describing its preferences. The session response is initially sent to the destination communication server 64, which continues to act as a SIP proxy (block 206). Notably, the session response is forwarded to the originating terminal 54 via the originating communication server 62 (blocks 208 and 210). Either the SIP destination user agent at the destination terminal 56 or the destination communication server 64 can append the MAO message to the session response that is ultimately sent to the originating terminal 54. At this point, both the originating and destination terminals 54, 56 have the MAO information. Preferably, the session response uses the session description protocol (SDP) to describe the capabilities and media types supported by the originating and destination terminals 54, 56. Essentially, SDP messages list the features that must be implemented at the endpoints.

For conformance with other exemplary call flows, Figure 4A depicts the originating terminal 54 forwarding a SIP PRACK message to the destination terminal through the originating and destination communication servers 62, 64 (blocks 212, 214 and 216). The destination terminal 56 will respond with a SIP 200 OK (PRACK) message to the originating terminal 54 via the destination and originating communication servers 64, 62 (blocks 218, 220 and 222). Once the SIP messaging has been exchanged between the originating and destination terminals 54, 56, each terminal has sufficient information regarding the other endpoint, bandwidth and other characteristics of the media exchange to facilitate a communication. At

this point, the endpoints, which are the originating and destination terminals 54, 56, need to act to reserve the necessary resources for the media stream facilitating communications.

5 RSVP is the preferred reservation setup and control protocol for streaming, media communications or other applications that may require circuit-switched emulation on an IP network 10. Typically, senders of information define outgoing traffic for the communication in terms of
10 the upper and lower bounds of bandwidth, delay and jitter. RSVP transmits PATH messages containing the traffic specification information to the destination address of the destination terminal 56. Each RSVP-enabled device within the IP network 10, such as the
15 originating and destination edge routers 58, 60, will establish a "PATH-state" that includes the previous source address of the PATH message to define each of the next-hop addresses between the originating and destination terminals 54, 56.

20 To set up the communication path, the originating terminal 54 will send a first PATH message, which includes the MAO, to the originating edge router 58 (block 224). The originating edge router 58 forwards the request, with the MAO, to its associated, originating
25 policy server 66 using COPS (block 226). The originating policy server 66 will verify that the requested services are authorized using the MAO, and assuming the request is authorized, the policy server will provide the favorable decision to the originating edge router 58 (block 228).
30 The originating edge router 58 will then forward the PATH message to the next hop in the IP network (block 230). Assuming the next hop is the destination edge router 60, the destination edge router will request the destination policy server 68 to authorize the requested services

(block 232). The request to the destination policy server 68 includes the MAO and uses COPS. Assuming the destination policy server 68 responds favorably to the request, the decision is provided to the destination edge
5 router 60 (block 234), which forwards the PATH message directly to the destination terminal 56 (block 236).

At this point, the connection information between the two endpoints has been established using SIP and the path has been defined using the PATH message. To
10 actually reserve resources, the receiving terminal, which is the destination terminal 56, sends a reservation request message (RESV) along the path to the source of the PATH message, the originating terminal 54. The RESV message will preferably include the traffic
15 specification, quality of service (QoS) level required and any other information necessary for reservation, such as the transport protocol and application port numbers. Although optional, the MAO may be provided with the RESV messaging as propagated from the destination terminal 56
20 to the originating terminal 54.

The RESV message traverses the network from the destination terminal 56 to the originating terminal 54 in an analogous fashion to the way the PATH message was sent from the originating terminal 54 to the destination
25 terminal 56. As such, the RESV message is sent from the destination terminal 56 to the destination edge router 60 (block 238), which requests the reservation from the destination policy server 68 (block 240). Assuming the request is accepted, the destination policy server 68
30 sends the decision back to the destination edge router 60 (block 242), which may report the reservation back to the destination policy server 68 for confirmation of the reservation (block 244). The destination edge router 60

will then forward the RESV message to the next hop in the network (block 246).

Referring now to Figure 4B and again assuming the next hop is the originating edge router 58, the RESV message is sent from there to the originating policy server 66 (block 248), which returns the decision to the originating edge router 58 (block 250). The originating edge router 58 will also report the reservation back to the originating policy server 66 using COPS (block 252) and send the RESV message to the originating terminal 54 (block 254). When an RSVP-enabled edge router, such as the originating and destination edge routers 58, 60, receives an RESV message, the edge router uses an admission control process to authorize the request and allocate the necessary resources. If the request is not satisfied do to lack of resources or an authorization failure, the edge router will return an error back to the destination terminal 56. If accepted, the edge router sends the RESV upstream to the next edge router along the path towards the originating terminal 54.

Once the originating terminal 54 receives the RESV message, it will return a reservation confirmation message (RESVCONF) back to the destination terminal 56 to complete the handshake to alert the destination terminal of a successful reservation along the entire path (block 256). At this point, a uni-directional communication path has been established for media flows from the originating terminal 54 to the destination terminal 56. A communication path is established only for delivery of media from the originating 54 to the destination terminal 56. If bi-directional communications are necessary, a separate path using RSVP must be established in the same fashion as above, from the destination terminal 56 to the originating terminal 54. To effect this, steps 218-256

are repeated in reverse order to establish a communication and reserve resources for data flow from the destination terminal 56 to the originating terminal 54.

5 At this point, sufficient resources have been reserved, and the originating terminal 54 sends a SIP message, indicating the resources have been reserved and all pre-conditions have been met, to the destination terminal 56 via the originating and destination
10 communication servers 62 and 64 (blocks 258, 260 and 262). Again, the originating and destination communication servers 62, 64 act as SIP proxies for SIP messaging. The destination terminal 56 will send a 200 OK to the originating terminal 54 via the destination and
15 originating communication servers 62, 64 (blocks 264, 266 and 268).

Assuming bi-directional communications have been arranged and that two paths were set up, one from the originating terminal 54 to the destination terminal 56
20 and one from the destination terminal 56 to the originating terminal 54, the destination user is alerted that a call has been received, by a method such as providing a windows notification or ringing the telephony device. Concurrently, the destination terminal 56 sends
25 a SIP ringing message (180 RINGING) to the originating terminal 54 via the destination and originating communication servers 64, 62 (blocks 270, 272 and 274). The originating terminal 54 may optionally acknowledge the 180 RINGING message by sending a PRACK message
30 (blocks 276, 278 and 280) to the destination terminal 56, which will respond with a 200 OK to the originating terminal 54 (blocks 282, 284 and 286).

Assuming that the destination user picks up the telephony device or answers the call in some fashion, the

destination terminal 56 will send a 200 OK to the originating terminal 54 indicating that the destination user has accepted the call (blocks 290, 292 and 294). The originating terminal 54 will acknowledge the 200 OK message with an ACK message to the destination terminal 56 (blocks 296, 298 and 300). At this point, a communications session is facilitated (block 302) as depicted in Figure 4C.

The communication session will continue until one of the users terminates the call or communication using a SIP BYE message. Assuming the originating user terminates the communication, the originating terminal 54 will send a BYE message to the destination terminal 56 via the originating and destination communication servers 62, 64 (blocks 304, 306 and 308). RSVP is used to tear down the communication path or paths. In a similar fashion to the path setup and reservation, the originating terminal 54 will send a teardown message (PATHTEAR) message to the originating edge router 58 (block 310), which will forward the PATHTEAR message over the network to the destination edge router 60 (block 312). The destination edge router 60 will forward the PATHTEAR message on to the destination terminal 56 (block 314). The originating and destination edge routers 58, 60 will send corresponding messages to the associated originating and destination policy servers 66, 68, respectively (blocks 316 and 318). The originating and destination policy servers 66, 68 will alert the corresponding originating and destination edge routers 58, 60 to remove the resource reservations (blocks 320 and 322).

Assuming a bi-directional telephony call, the path from the destination terminal 56 to the originating terminal 54 must also be torn down in a similar fashion

using RSVP. A PATHTEAR message is sent from the destination terminal 56 to the originating terminal 54 via the destination and originating edge routers 60, 58 (blocks 324, 326 and 328). Notably, any other routing or like devices between the originating and destination edge routers 58, 60 that require reservation of resources will receive the teardown messaging. The originating and destination edge routers 58, 60 will alert the originating and destination policy servers 66, 68 of the
5 teardown request (blocks 330 and 332). The originating and destination policy servers 66, 68 will return authorization to recommit the reserve resources to the originating and destination edge routers 58, 60 (blocks 334 and 336). At this point, the RSVP messaging is
10 complete and a final SIP message from the destination terminal 56 to the originating terminal 54 is sent as a 200 OK in response to the BYE message initiated by the originating terminal 54. The 200 OK is sent from the destination terminal 56 to the originating terminal 54
15 via the destination communication server 64 and the originating communication server 62 (blocks 338, 340 and 342). Although SIP is the preferred call signaling protocol, those skilled in the art will quickly recognize that other call signaling protocols such as H.323, H.248,
20 or the like may be applicable.
25

It is important to recognize when reviewing the above disclosure that the present invention is applicable in any number of uni-directional or bi-directional communications. The invention has applications for
30 providing uni-directional audio and video from an originating terminal to a destination terminal. In such a case, the originating terminal may be a streaming audio/video server. The server may be associated with a movie studio, cable company or television network.

Likewise, bi-directional communications may facilitate telephony exchanges between two or more parties engaged in a telephone call wherein a portion of the call is sent over a packet-switched network, such as the IP network

5 10. The various routers and network elements using the authorization indicia for access and reservation of resources may use the authorization indicia in various ways.

As discussed above, the network elements may access
10 policy servers or like systems to check out or approve authorization. The various elements may have the policy making decision incorporated therein. As an example, the originating or destination edge routers may be configured to have policy-making capability and may not need to gain
15 approval from a separate policy server or system. The switching and routing devices, such as the edge routers in a cable system, may be the cable modem termination system (CMTS). Those skilled in the art will recognize that the concepts of the present invention are applicable
20 to various networking technologies, including Asynchronous Transfer Mode (ATM) networks. In an ATM environment, a MAO or like object may be used in a set-up message for establishing a switched virtual circuit.

Figure 5 is a simplified, block representation of an
25 edge router, such as the originating edge router 58. The edge router 58 will preferably have a control system 70 associated with memory 72 having the requisite software 74 for operation. The control system 70 will control a network interface 76 and an optional access interface 78.
30 Preferably, the network interface 76 is a traditional packet-switched network for communicating with any local area network facilitating communications with the IP network 10. The access interface 78 may be any type of interface necessary to facilitate communications with the

associated communication network. For example, the access interface may be a TDM interface for handling PSTN traffic, or may be a CMTS interface for a cable system. Those skilled in the art will recognize the various types
5 of interfaces and the necessary configuration of the control system to allow operation of any particular interface.

Figure 6 depicts a call server, such as the originating call server 62. The call server 62 may
10 include a control system 80 associated with memory 82 having the necessary software 84 to facilitate operation. The call server 62 will include a network interface 86 to facilitate communications over the IP network 10 or other packet-switched network.

15 The policy servers, such as the policy server 66, will also include a control system 88, memory 90 and the requisite software 92 for operation as shown in Figure 7. A network interface 94 for communications over the IP network 10 or like packet-switched network is also
20 provided.

Those skilled in the art will recognize various modifications of and improvements to the concepts of the present invention. These modifications are considered within the scope of the disclosure and the claims that
25 follow.

Claims

What is claimed is:

1. A method of authorizing communications comprising:
 - 5 a) receiving a request for authorization to establish a communication with a destination terminal from an origination terminal;
 - b) generating authorization indicia for the communication, the authorization indicia
10 configured to enable reservation of resources for the communication; and
 - c) sending the authorization indicia to at least one of the originating and destination terminals to facilitate reservation of resources for the
15 communication, wherein the at least one of the originating and destination terminals receiving the authorization indicia will send the authorization indicia to at least one network element to reserve resources for at least a
20 portion of the communication.
2. The method of claim 1 wherein the sending step
25 comprises sending the authorization indicia to the originating and destination terminals to facilitate reservation of resources for the communication, wherein the originating and destination terminals receiving the authorization indicia will send the authorization to corresponding network elements
30 forming part of the communication path to reserve resources for portions of the communication.
3. The method of claim 1 further comprising verifying the user of the originating terminal is capable of receiving services providing the communication.

4. The method of claim 1 wherein the step of generating authorization indicia comprises authenticating the authorization indicia for use by the at least one network element.
5. A method of authorizing communications comprising:
- a) receiving a request from at least one of an originating terminal and a destination terminal to reserve resources for a communication between the originating terminal and the destination terminal, the request associated with authorization indicia provided to the originating terminal by a service provider and configured to enable reservation of resources for the communication; and
- b) reserving resources for at least a portion of the communication based on the authorization indicia.
6. The method of claim 5 wherein the receiving step comprises receiving requests from both the originating and destination terminals and the reserving step comprises reserving resources for the communication at a first network element associated with the originating terminal using the request received from the originating terminal and reserving resources for the communication at a second network element associated with the destination terminal using the request received from the destination terminal.
7. The method of claim 6 further comprising provisioning for resources for the communication

over a network between the first and second network elements based on the authorization indicia.

- 5 8. The method of claim 5 further comprising
establishing a second communication from the
destination terminal to the original destination and
reserving resources for at least a portion of the
second communication based on the authorization
indicia.
- 10 9. A terminal for effecting communications comprising a
network interface and a control system associated
with said network interface, said control system
adapted to:
- 15 a) send a request to establish a communication with
a remote terminal over a network to a service
provider;
- 20 b) receive authorization indicia configured to
enable reservation of resources for the
communication from the communication server in
response to the request to establish the
communication; and
- 25 c) send a request associated with the authorization
indicia to a network element to reserve
resources for the communication wherein the
authorization indicia is configured to enable
the network element to reserve sufficient
resources for at least a portion of the
communication.
- 30 10. The terminal of claim 9 wherein said control system
is further adapted to effect the communication over
a communication path having the reserved resources

with the destination terminal via the network element.

- 5 11. The terminal of claim 10 wherein said control system is adapted to effect a second communication over a second communication path with the destination terminal via the network element.
- 10 12. The terminal of claim 9 wherein said terminal is a cable terminal and said control system facilitates at least one of the group consisting of receiving or transmitting audio and video via the communication.
- 15 13. The terminal of claim 9 wherein said terminal is a telephony terminal and said control system facilitates at least one of the group consisting of receiving or transmitting audio via the communication.
- 20 14. The terminal of claim 9 wherein said terminal is a receiver and said control system facilitates at least one of the group consisting of receiving at least one of the group consisting of audio and video via the communication.
- 25 15. A router for effecting a communication comprising a network interface and a control system associated with said network interface, said control system adapted to:
- 30 a) receive a request to reserve resources for a communication between the originating terminal and the destination terminal, the request associated with authorization indicia provided to the originating terminal by a service

provider and configured to enable reservation of resources for the communication;

b) reserve resources for at least a portion of the communication based on the authorization

5 indicia; and

c) route information to effect the communication.

16. The router of claim 15 wherein said request and authorization indicia is received from a terminal.

10

17. The router of claim 15 wherein said request and authorization indicia is received from another router.

15 18. The router of claim 15 wherein said control system is further adapted to forward the authorization indicia to another router along a communication path facilitating the communication to enable reservation of resources for the communication.

20

19. The router of claim 15 wherein said control system is further adapted to forward the authorization indicia to a policy server and receive approval for the reservation of the resources for the
25 communication from the policy server based on the authorization indicia.

25

20. A communication server for facilitating communications, said communication server comprising
30 a network interface and a control system adapted to:
a) receive a request for authorization to establish a communication with a destination terminal from an origination terminal;

30

- b) generate authorization indicia for the communication, the authorization indicia configured to enable reservation of resources for the communication; and
- 5 c) send the authorization indicia to at least one of the originating and destination terminals to facilitate reservation of resources for the communication, wherein the at least one of the originating and destination terminals receiving
- 10 the authorization indicia will send the authorization indicia to at least one network element to reserve resources for at least a portion of the communication.
- 15 21. The communication server of claim 20 wherein said control system is further adapted to send the authorization indicia to the originating and destination terminals to facilitate reservation of resources for the communication, wherein the
- 20 originating and destination terminals receiving the authorization indicia will send the authorization to corresponding network elements forming part of the communication path to reserve resources for portions of the communication.
- 25 22. The communication server of claim 20 wherein said control system is further adapted to verify the user of the originating terminal is capable of receiving services providing the communication.
- 30 23. The system of claim 20 wherein said control system is further adapted to authenticate the authorization indicia for use by the at least one network element.

24. A policy server for approving resource reservation for a router in a network, said policy server comprising a network interface and a control system associated with said network interface, said control system adapted to:
- 5
- a) receive a request to approve reservation of resources for a communication from a router, the request including authorization indicia configured to enable reservation of resources

10

 - b) determine whether to approve the reservation of resources for the communication based on the authorization indicia; and
 - c) send a response to the request to the router

15

 - indicating whether the request for the reservation of resources was approved.
25. The policy server of claim 24 wherein said control system is further adapted to communicate with a
- 20
- service provider to confirm the reservation of resources is appropriate based on the authorization indicia.
26. The policy server of claim 24 wherein said control system is further adapted to communicate with an
- 25
- authentication service to confirm the authorization indicia is authentic.
27. A computer readable medium comprising software for
- 30
- instructing a computer to:
- a) send a request to establish a communication with a remote terminal over a network to a service provider;

- 5 b) receive authorization indicia configured to
enable reservation of resources for the
communication from the communication server in
response to the request to establish the
communication; and
- 10 c) send a request associated with the authorization
indicia to a network element to reserve
resources for the communication wherein the
authorization indicia is configured to enable
the network element to reserve sufficient
resources for at least a portion of the
communication.
- 15 28. The computer readable medium of claim 27 comprising
further instructions to effect the communication
over a communication path having the reserved
resources with the destination terminal via the
network element.
- 20 29. The computer readable media of 28 comprising further
instructions to effect a second communication over a
second communication path with the destination
terminal via the network element.
- 25 30. A computer readable medium comprising software for
instructing a computer to:
- 30 a) receive a request to reserve resources for a
communication between the originating terminal
and the destination terminal, the request
associated with authorization indicia provided
to the originating terminal by a service
provider and configured to enable reservation of
resources for the communication;

- b) reserve resources for at least a portion of the communication based on the authorization indicia; and
- c) route information to effect the communication.

5

31. The computer readable medium of claim 30 comprising further instructions to forward the authorization indicia to another router along a communication path facilitating the communication to enable reservation of resources for the communication.

10

32. The computer readable medium of claim 30 comprising further instructions to forward the authorization indicia to a policy server and receive approval for the reservation of the resources for the communication from the policy server based on the authorization indicia.

15

33. A computer readable medium comprising software for instructing a computer to:

20

- a) receive a request for authorization to establish a communication with a destination terminal from an origination terminal;
- b) generate authorization indicia for the communication, the authorization indicia configured to enable reservation of resources for the communication; and
- c) send the authorization indicia to at least one of the originating and destination terminals to facilitate reservation of resources for the communication, wherein the at least one of the originating and destination terminals receiving the authorization indicia will send the authorization indicia to at least one network

25

30

element to reserve resources for at least a portion of the communication.

- 5 34. The computer readable medium of claim 33 comprising further instructions to send the authorization indicia to the originating and destination terminals to facilitate reservation of resources for the communication, wherein the originating and destination terminals receiving the authorization
- 10 indicia will send the authorization to corresponding network elements forming part of the communication path to reserve resources for portions of the communication.
- 15 35. The computer readable medium of claim 33 comprising further instructions to verify the user of the originating terminal is capable of receiving services providing the communication.
- 20 36. The computer readable medium of claim 33 comprising further instructions to authenticate the authorization indicia for use by the at least one network element.

Abstract of the Disclosure

The present invention provides for a communication server of a service provider to authorize resource reservation for a communication over a packet-switched network without requiring the communication server to know the identity of or significant details about the network elements providing the communication. The communication server is configured to provide secure authorization indicia to the terminal receiving or delivering information for the communication. The terminal presents the authorization indicia to one or more network elements involved in reserving resources for the communication. The network element or elements will use the authorization indicia to authorize resource reservation for the communication, and may forward the authentication to additional network elements involved in reserving resources for the communication.

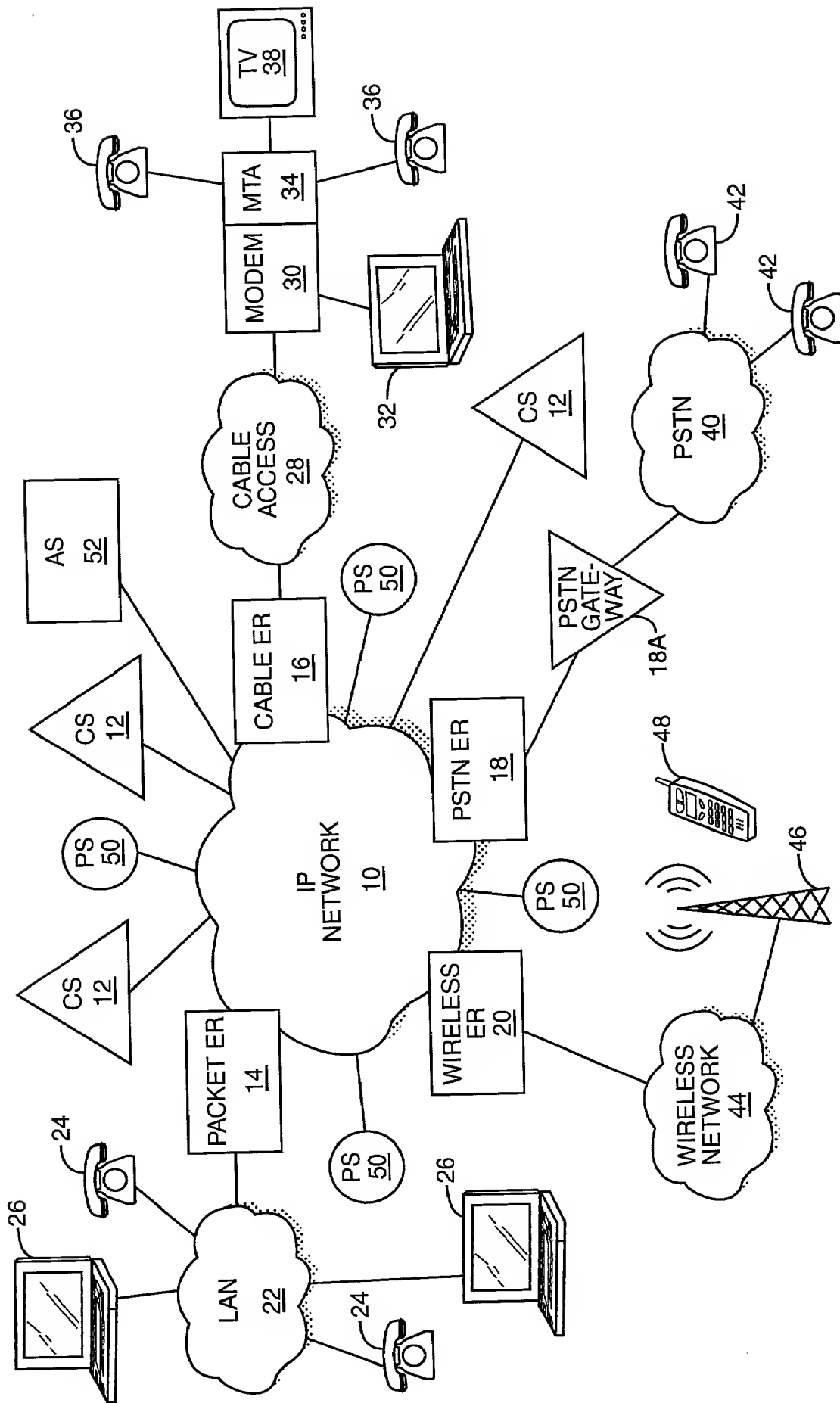


FIG. 1

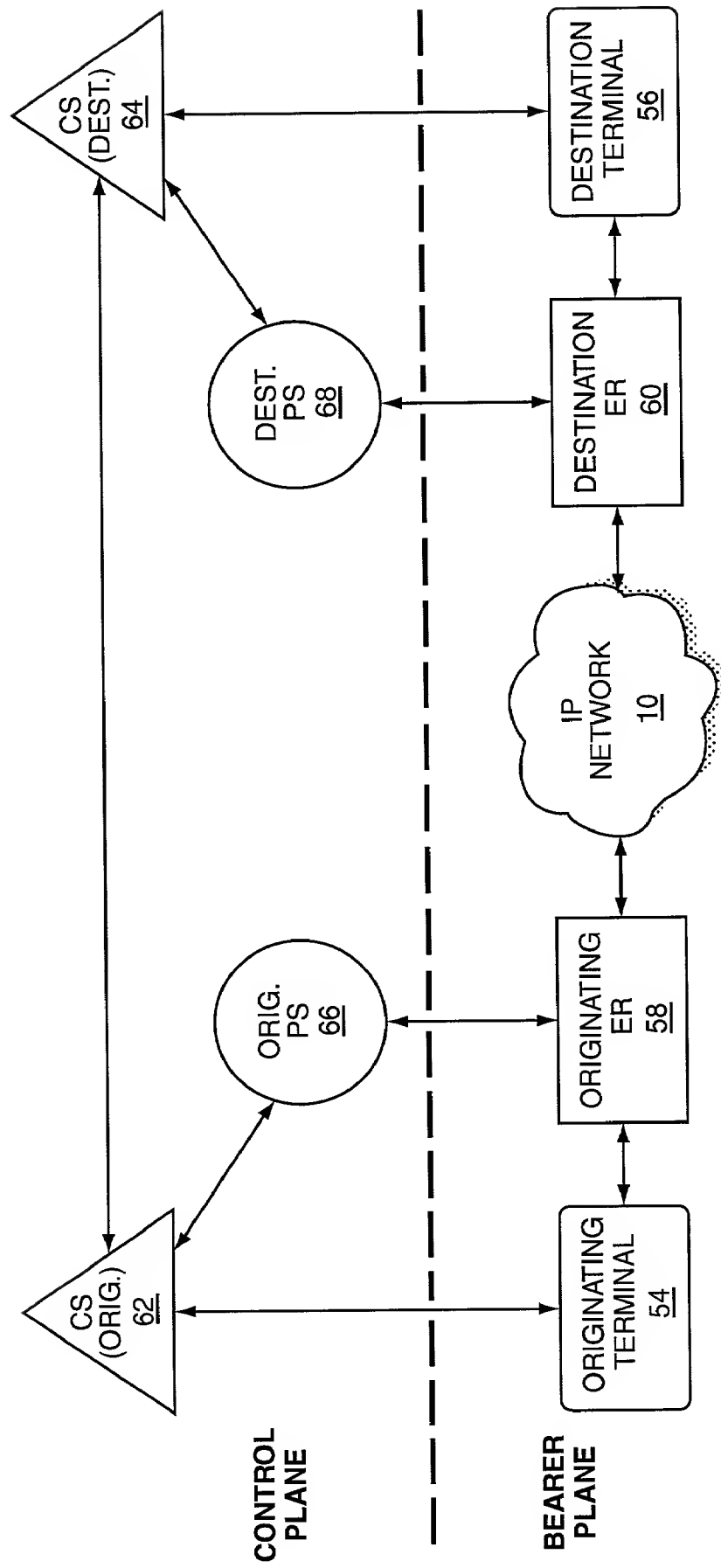


FIG. 2

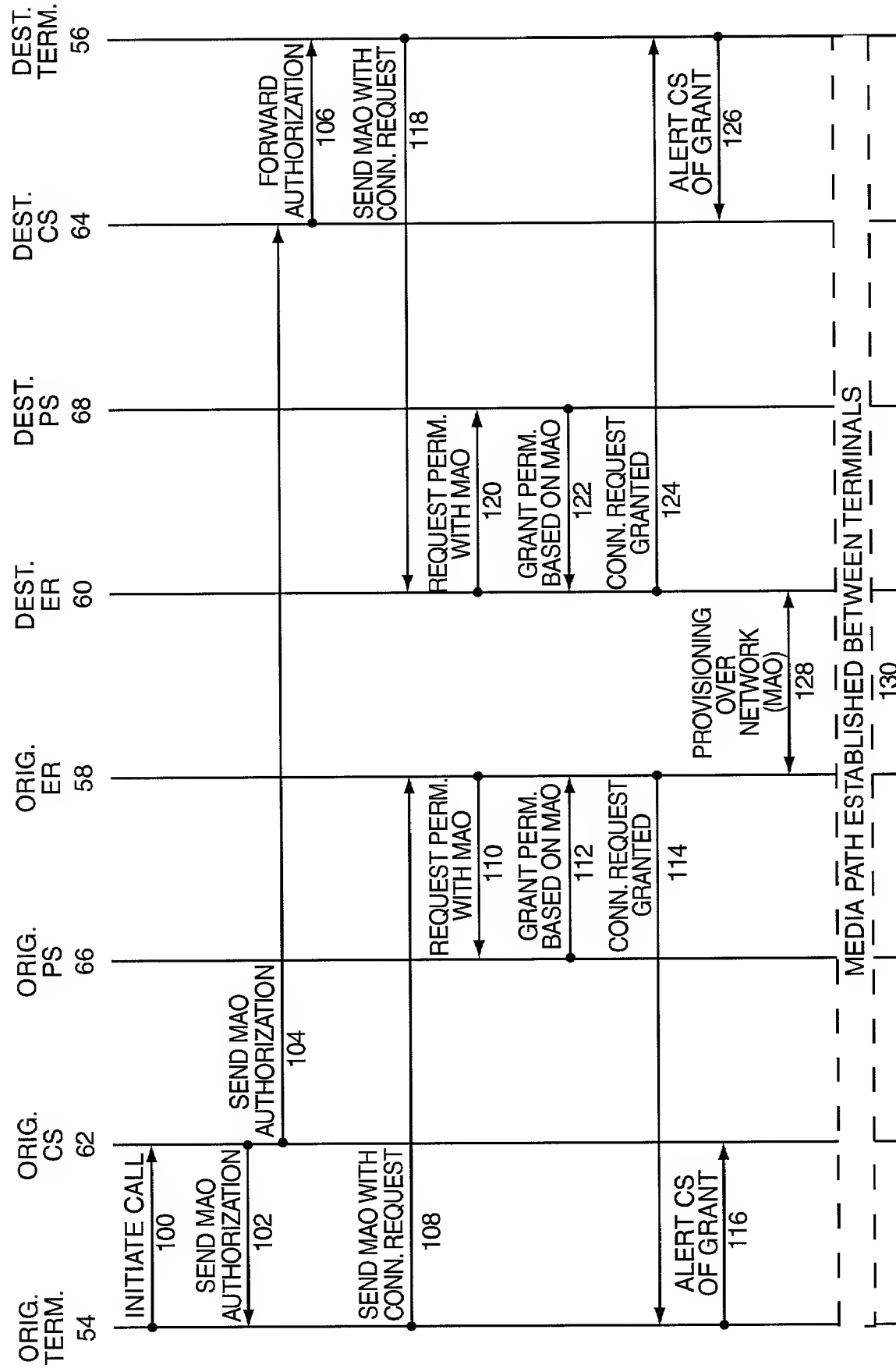
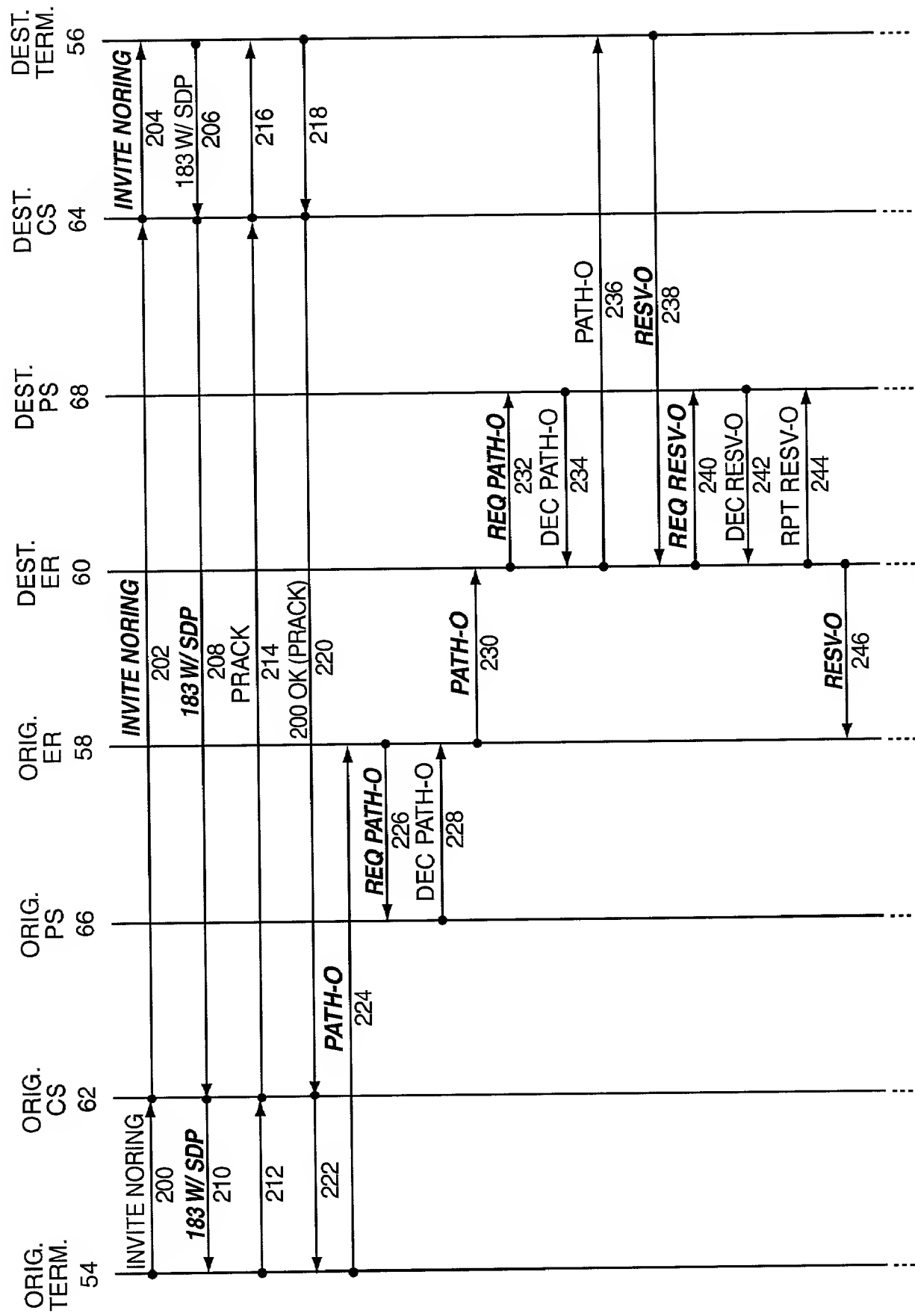


FIG. 3



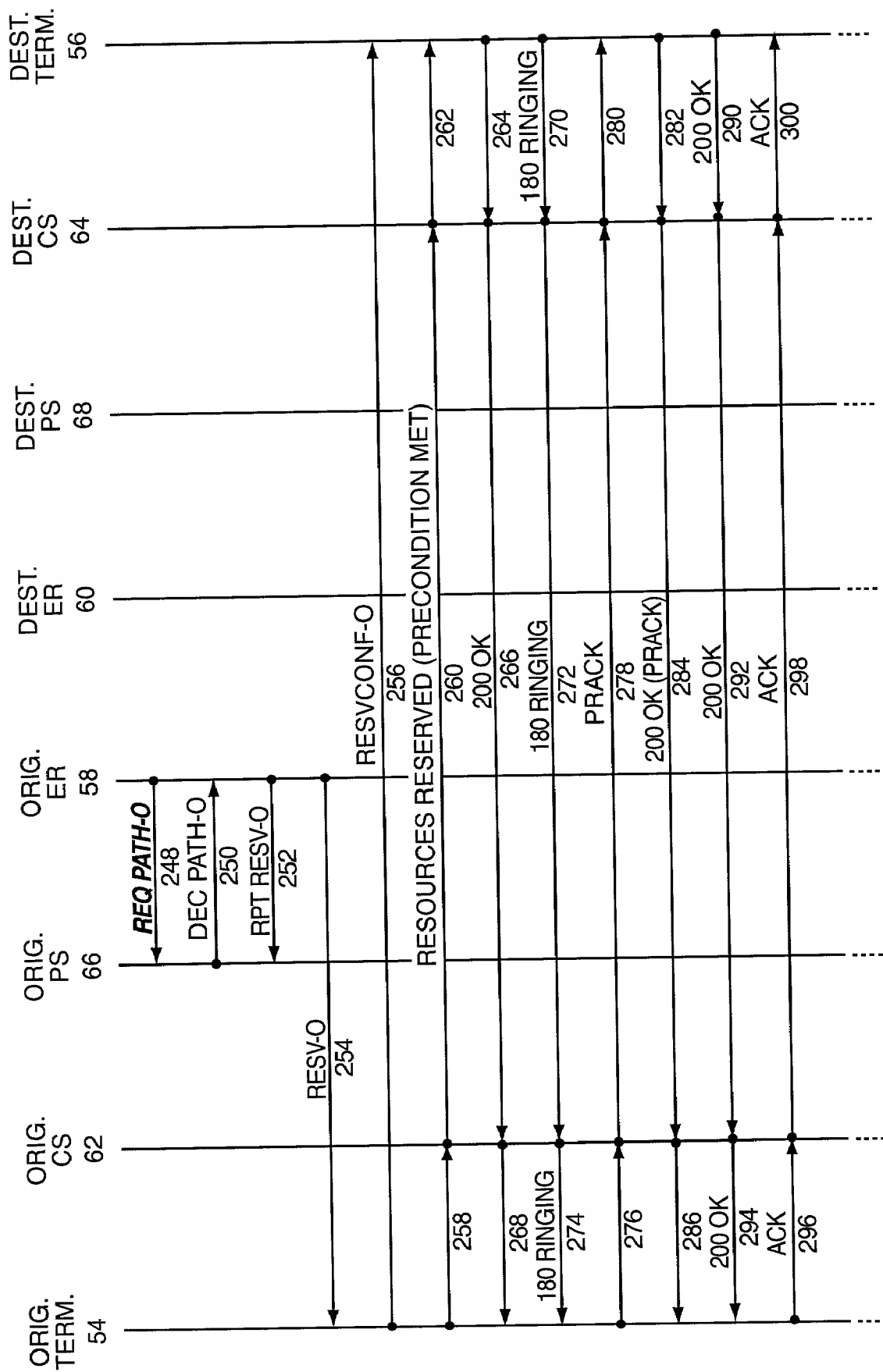


FIG. 4B

FIG. 4C

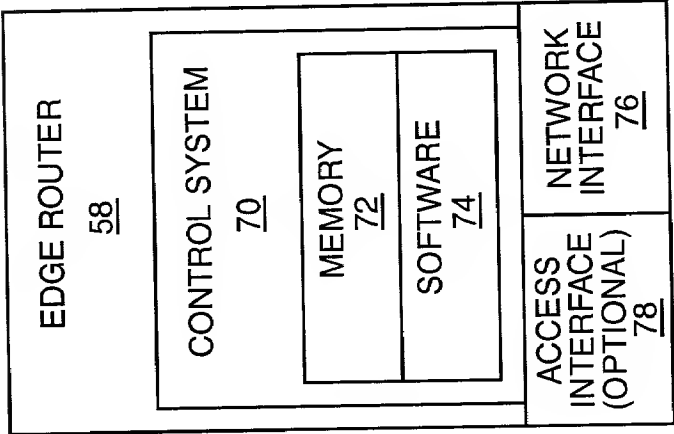


FIG. 5

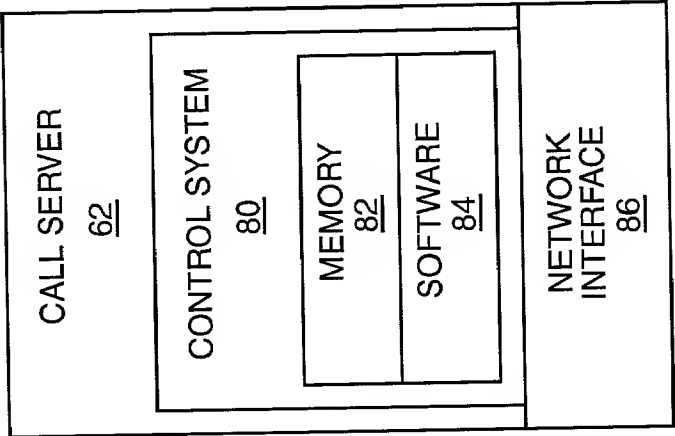


FIG. 6

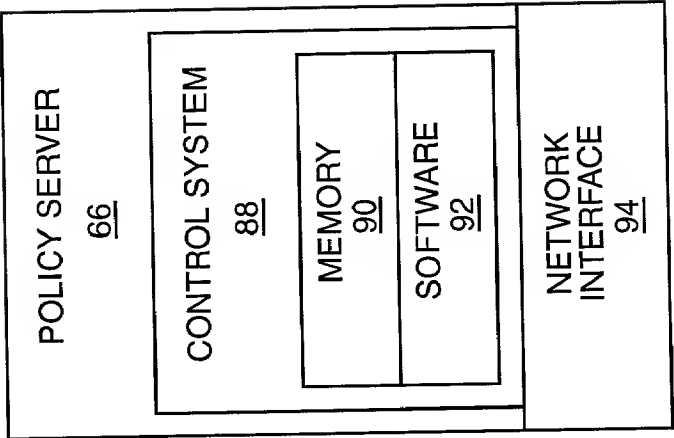


FIG. 7

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)	Attorney Docket Number	7000-041
	First Named Inventor	Reeves, Douglas S.
	COMPLETE IF KNOWN	
	Application Number	/
<input checked="" type="checkbox"/> Declaration Submitted with Initial Filing OR <input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)	Filing Date	
	Group Art Unit	
	Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

AUTHORIZING COMMUNICATION SERVICES

(Title of the invention)

the specification of which



is attached hereto

OR



was filed on (MM/DD/YYYY) as United States Application Number or PCT International

Application Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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Name of Sole or First Inventor:

☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])				Family Name or Surname			
Douglas S.				Reeves			
Inventor's Signature	<i>Douglas S. Reeves</i>			Date	10-10-2000		
Residence: City	Raleigh	State	NC	Country	USA	Citizenship	USA
Post Office Address	1701 Lorimer Road						
Post Office Address							
City	Raleigh	State	NC	ZIP	27606	Country	USA

☒ Additional inventors are being named on the 1 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

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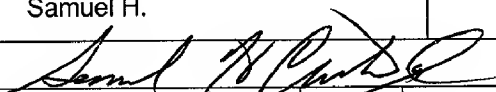
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DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet Page <u>1</u> of <u>1</u>
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Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Samuel H.				Christie, IV			
Inventor's Signature				Date	October 16, 2000		
Residence: City	Cary	State	NC	Country	USA	Citizenship	USA
Post Office Address	309 Trappers Run Drive						
Post Office Address							
City	Cary	State	NC	ZIP	27513	Country	USA
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Inventor's Signature				Date			
Residence: City		State		Country		Citizenship	
Post Office Address							
Post Office Address							
City		State		ZIP		Country	
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Inventor's Signature				Date			
Residence: City		State		Country		Citizenship	
Post Office Address							
Post Office Address							
City		State		ZIP		Country	

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